Ethnic fractionalization, natural resources and armed conflict

Basedau, Matthias; Wegenast, Tim C.

Ethnic fractionalization, natural resources and armed conflict

Tim C. Wegenast and Matthias Basedau

Conflict Management and Peace Science published online 15 November 2013
DOI: 10.1177/0738894213508692

Article

cmps

Conflict Management and Peace Science
0(0) 1–26

DOI: 10.1177/0738894213508692
cmp.sagepub.com
SAGE

Ethnic fractionalization, natural resources and armed conflict

Tim C. Wegenast
University of Konstanz, Germany

Matthias Basedau
GIGA German Institute of Global and Area Studies, Germany

Abstract
Thus far, researchers working on ethnicity and resources as determinants of civil conflict have operated largely independently of each other. While there is plenty of evidence that natural resources may spur armed conflict, empirical evidence for the nexus between ethnic fractionalization and conflict remains inconclusive. Some authors conclude that ethnically fractionalized societies are actually spared from intrastate violence. Others find either a positive relationship or none at all between ethnic fragmentation and internal conflict. In this context, this paper serves two purposes: first, it shows that salience-based fractionalization indices are associated with a higher risk of ethnic conflict onset; second, it finds evidence that oil further increases the conflict potential within fractionalized countries. The combination of oil and a shared identity seems to help overcome the collective action problems associated with rebellion, by providing recruitment pools, strong motives and the necessary financial means for insurgency. Employing logit models for pooled time-series cross-sectional data, our quantitative analysis shows that various ethnic fractionalization indicators are robustly linked to a substantially increased risk of ethnic armed conflict onset in a subset of oil-abundant countries.

Keywords
Conflict, ethnic fragmentation, ethnic violence, natural resources, oil

Introduction

Within the peace and conflict literature, the role of ethnic fractionalization as a potential risk factor for the onset of intrastate conflicts is a highly disputed topic. Results from quantitative studies point in different directions: while some authors have found a negative or curvilinear effect (e.g. Collier and Hoeffler, 2004; Ellingsen, 2000; Reynal-Querol, 2002), others

Corresponding author:
Tim C. Wegenast, Department of Politics and Management, University of Konstanz Box D86, 78457 Konstanz, Germany.
Email: tim.wegenast@uni-konstanz.de

have shown that fractionalization is positively associated with internal violence (Schneider and Wiesehomeier, 2008; Taydas and Peksen, 2012). A third group of scholars has found no relationship between ethnic fractionalization and armed conflicts (Fearon and Laitin, 2003; Østby et al., 2009).

The studies cited above all employ fractionalization measures that have been increasingly criticized in recent years (see, e.g. Cederman and Girardin, 2007). Furthermore, they do not explicitly differentiate between ethnic and non-ethnic violence when defining their dependent variables. In light of these shortcomings, this paper readdresses the issue of whether intrastate conflict is contingent on a country's level of ethnic fractionalization or not. In particular, it asks what factors may facilitate ethnic group's mobilization for rebellion, arguing that the presence of natural resources increases the risk of violence within fractionalized societies.

As Nobel Laureate Amartya Sen (2008) put forward, neither cultural nor economic approaches seem sufficient to explain intrastate violent conflict. While the juxtaposition of "greed" and "grievance" in Collier and Hoeffler's (2004) seminal work suggests that it is *either* resource-related opportunity ("greed") *or* identity-related deprivation ("grievances") that is the explanatory factor in the onset of intrastate conflict, we argue instead that ethnic diversity and natural resources actually interact and form a particularly dangerous combination.

Both ethnic diversity and natural resources can provide the motive and opportunity for armed conflict, thus easing the collective action and coordination problems of rebellion. Ethnic identities form recruitment pools for potential rebels and may increase the opportunities to mobilize for political insurgency, particularly when the involved ethnic groups feel marginalized in political, economic or other terms. Natural resource production may generate ecologically, socially or revenue-related grievances or aspirations, which may overlap with ethnic-based disaffection and therein produce mutually reinforcing conflict risks. Moreover, resources may make rebellion feasible by providing the necessary financial means for it to occur, and may help ethnic groups to overcome their collective action problem by offering private rewards.

There is anecdotal evidence that the combination of natural resources and ethnicity has in fact already spurred violence in several countries. Separatist conflicts in Angola (Cabinda), Indonesia (Aceh) and Nigeria (Niger Delta) are illustrative of exactly this pattern. Although several case studies have already considered the joint effect of resources and ethnoreligious cleavages as a way to explain civil unrest (Aspinall, 2007; Fox and Swamy, 2008; Humphreys and Mohamed, 2005; Le Billon, 2001; Oyefusi, 2008), thus far there have been—to the best of our knowledge—very few systematic attempts to analyze this phenomenon from a quantitative, macrocomparative perspective.

Hence, this paper strives to reconcile the literatures on the ethnic and economic determinants of armed conflict, showing that resource-abundant and ethnically diverse countries constitute a unique sample in which specific causal mechanisms are at play. For this purpose the analysis will apply logit estimations for pooled time-series cross-sectional data, therein making use of a subsample strategy.

The paper proceeds as follows: the next section reviews the existing literature on the impact of natural resources and ethnic diversity on internal violence. The paper's main argument is subsequently presented, wherein light is shed on why ethnically fractionalized societies may experience armed conflict in the presence of natural resources. The employed quantitative research design is then described, which is followed by the paper's quantitative findings. These findings are further discussed and illustrated by descriptive evidence from a

number of pertinent country cases. The last section draws conclusions and points to possible areas of future research.

Review of current research on natural resources, ethnic diversity and armed conflict

Influenced by the pioneering research of Paul Collier and Anke Hoeffler, a rising body of literature has advanced our knowledge about the relationship between natural resource abundance and conflict propensity. According to many authors, primary commodities often increase the risk of civil war commencement by providing would-be rebels with the opportunity to finance large-scale violence, as well as creating the incentive for opportunistic behavior by rebel groups (see, e.g. Collier and Hoeffler, 2004). Further motivation for rebellion may stem from characteristics of resource production, such as the unequal distribution of resource revenues, forced migration or environmental damage (e.g. Ross, 2004).

Other scholars claim that resources impact more indirectly on conflict. First, resources may instigate predatory rent-seeking behavior, which simultaneously reduces the quality of institutions' and states' counterinsurgency capacity (see, e.g. Fearon, 2005; Fearon and Laitin, 2003; Humphreys, 2005). Second, resource production may create economic and social grievances, resulting from resource-related price shocks, currency appreciations and increasing inequalities (e.g. Ross, 2004).[1]

In recent years, the resource–conflict link has increasingly been questioned. Academics stress the necessity of examining the precise conditions under which primary commodities unleash violence (e.g. Collier and Hoeffler, 2005; Humphreys, 2005). Contextual conditions considered by the literature include: characteristics of the available resource (Le Billon, 2001; Ross, 2012; Snyder and Bhavnani, 2005); the mode of extraction of the commodities in question (Lujala et al., 2005); and the point in time at which revenues arrive (Humphreys, 2005). As shown by different studies, not all natural resources have the same conflict potential. Oil and gas in particular have been found to promote intrastate violence in various analyses (see Fearon and Laitin, 2003; Hegre and Sambanis, 2006; Lujala, 2010; Ross, 2006).

Recent work has specified the conditions under which oil becomes a source of conflict. Lujala (2010) finds that oil only increases the likelihood of conflict onset when being produced in a more lootable manner—that is, onshore instead of offshore (Lujala, 2010). Moreover, very high revenues from oil may allow governments to employ peace-buying rentier mechanisms, such as repression, redistributional policies and patronage (Basedau and Lay, 2009; Fjelde, 2009). Looking at other resources, secondary diamonds in particular are linked to armed conflict onset since they are easily lootable (see Le Billon, 2008; Lujala et al., 2005).

Research on the ethnicity–conflict nexus has grown in recent years.[2] Three major mechanisms connecting ethnic diversity to a higher risk of civil conflict are frequently cited in the literature. First, ethnically diverse societies tend to grow more slowly (Mauro, 1995) and have a low level of public goods provision (e.g. Habyarimana et al., 2007). Both effects may indirectly increase the potential for conflict. Second, ethnic group identities are a resource for mobilization. So-called "instrumentalists" assert that ethnic identities—under certain circumstances—may serve as tools that individual group leaders can use for their political and financial aims (see Blimes, 2006; Østby, 2008). In this way, the collective action problem can be avoided and people can be mobilized (Gurr, 2000; Olson, 1965; Tilly, 1978). A third

strand of the literature can be labeled the "grievance" school of thought, in which it is suggested that ethnic conflict is particularly likely when ethnic groups suffer from (perceived) relative deprivation (Gurr, 2000) or horizontal inequalities (e.g. Stewart, 2002).

The quantitatively oriented debate has long been dominated by the question of which particular constellation of ethnic groups is most prone to conflict. Scholars have generally differentiated between the concepts of ethnic polarization, dominance and fractionalization when assessing ethnoreligious heterogeneity. Following Horowitz (1985), Esteban and Ray (1994) were among the first to introduce the concept of polarization. Polarization can be understood as "the extent to which the population is *clustered* around a small number of distant *poles*" (Esteban and Schneider, 2008: 133).[3] Subsequent studies have confirmed that an environment in which there are a few equal-sized identity groups with opposing interests is more conducive to civil violence than one in which there are many small groups (see Montalvo and Reynal-Querol, 2005; Schneider and Wiesehomeier, 2008).[4]

Collier and Hoeffler (2004) suggest that the contested dominance of one group explains outbreaks of civil violence. In need of social cohesion, newly formed insurgent militia may restrict recruitment to a single ethnic or religious group. This finding is supported by Horowitz (1985), who had already asserted that there is more violence in societies in which a large ethnic majority faces an ethnic minority.[5]

While ethnic polarization and dominance are generally believed to increase civil war potential, high ethnic fractionalization is often associated with more peaceful societies. There are several different ways to measure ethnic diversity. Commonly scholars use indices of fractionalization (e.g. Fearon, 2003), but in a general sense countries can be considered ethnically highly diverse or fragmented when these societies are split up into several distinct ethnic groups. Horowitz (1985) noted that the relationship between ethnic diversity and civil conflicts is not monotonic. According to him, the risk of internal violence decreases in highly homogeneous and highly heterogeneous societies. Collier and Hoeffler (1998) and Ellingsen (2000) corroborate this claim, by showing that countries with a moderate amount of ethnic fractionalization are more likely to experience the outbreak of civil war. Fearon and Laitin (2003) and Østby et al. (2009), on the other hand, find no relationship between a measure of ethnoreligious fractionalization and the likelihood of armed conflict onset.

According to Collier and Hoeffler (2004: 570), a diverse society may "reduce the opportunity for rebellion by limiting the recruitment pool". In a similar vein, Reynal-Querol (2002) argues that, within highly fractionalized societies, groups are less likely to overcome the collective action problem and thus to organize efficiently for rebellion. Schneider and Wiesehomeier (2008) find that fractionalization can be linked to low-intensity intrastate conflicts in democracies (whereas this effect is insignificant for pure autocracies). A recent analysis by Taydas and Peksen (2012) finds a positive and significant association between ethnic fractionalization and civil conflict.

All the empirical analyses of the link between ethnic fragmentation and intrastate violence reported above employ the same kind of ethnolinguistic fractionalization measurements that were developed, for example, by Fearon (2003) or Alesina et al. (2003). Theses indices are, however, highly disputable, particularly because they do not account for either the political salience of ethnic groups (Posner, 2004) or the political relations between them. There is empirical evidence that inequalities between ethnic groups as well as specific ethnopolitical power constellations—rather than simple demographic diversity measures—matter most with regard to the likelihood of armed conflict. A new dataset on ethnic power relations (EPR) has systematically collected information on groups' access to power between

1945 and 2009. Quantitative analyses (Cederman et al., 2009, 2010; Wimmer et al., 2009) have demonstrated that the exclusion of ethnic groups robustly increases the risk of several forms of armed conflict. Applying spatial tests using disaggregated and group-level data, Cederman et al. (2011) stress the role of political and economic ethnic grievances as promoters of internal conflict. The authors find that those groups that are affluent and those that are poor relative to the national average are more likely to engage in violence.

While many studies have explored ethnicity and natural resources as possible determinants of civil conflict, empirical research on the combination of resources and ethnic diversity is still scarce. Several case studies have already addressed the issue of ethnic heterogeneity within a resource-rich environment in a rather qualitative manner. Contemplating the ethnic divisions in Angola, Le Billon (2001), for example, stresses the significance of natural resources to conflict. Analyzing the separatist conflict in Aceh, Indonesia, Aspinall (2007) states that other resource-rich Indonesian provinces have not experienced similar violence because of the absence within them of an "appropriate identity-based collective action frame" (Aspinall, 2007: 950).

Quantitative studies that address this issue are extremely rare. A paper by Bulte and Brunnschweiler (2009) finds initial support for the conflict-proneness of ethnic fractionalization and resources. However, their testing is limited to a purely macroquantitative analysis that employs an all-resources variable available for only "around 90 countries for the year 1994" (Bulte and Brunnschweiler, 2009: 5), and their results for the interaction between ethnic fractionalization and resources are not robust across different model specifications. Another possible exception might be Østby et al. (2009), who construct new disaggregated data on welfare and socioeconomic inequalities within and between subnational units and find that regional-relative deprivation in assets, combined with natural resource abundance, *does* foster internal violence. Although methodologically innovative and highly insightful, the study is limited to a sample of 22 sub-Saharan African countries and concentrates rather on regional inequalities (whereas our paper focuses instead on ethnic diversity).[6]

More recently, Sorens (2011) has looked at the constituencies of "minorities at risk" and finds evidence that resource abundance has zero effect on the likelihood of the involvement of these groups in conflict, but does increase the risk of territorial—mostly secessionist—conflict. His sophisticated and disaggregated analysis has substantially advanced the debate, but his analysis of ethnicity is limited to the data provided by the research project Minorities at Risk. This data has been criticized for a number of different reasons, such as the neglect of ethnic groups at the center (Cederman et al., 2011: 484). While the author matches intrastate conflicts with ethnopolitical groups in the Minority at Risk dataset to construct his dependent variable, we test a potential joint (i.e. interactive or conditional) effect of ethnicity and natural resources using subsamples. In employing this approach, our results do not confirm the zero net effect of resource abundance on the total risk of ethnic intrastate conflict.

Why the combination of ethnic fractionalization and natural resources may be particularly dangerous

This paper claims that, whenever natural resources are present, high(er) ethnic diversity may actually lead to a higher intrastate conflict propensity. Our argument is simple: in ethnically fractionalized countries, natural resources can provide additional motive and opportunity to help groups overcome their collective action problem. Greater ethnic diversity also increases

the likelihood that politically relevant—or even deprived—ethnic groups live in areas with stocks of natural resources, resulting in a mutually reinforcing combination of armed conflict risks.

Natural resources may channel the types of incentives needed for the outbreak of identity-based conflict. Hoeffler and Collier (2006) have already made the case that secessionist conflict is essentially about resources. According to Østby (2008: 144), already-existing ethnic cleavages that coincide with inequalities "may enhance both grievances and group cohesion among the relatively deprived and thus facilitate mobilization for conflict" (see also, Gurr, 2000; Murshed and Gates, 2005; Stewart, 2002).

A recent study by Cederman et al. (2011) has stressed the role of grievances in promoting ethnonationalist civil wars. The authors argue that contemporary research has focused almost exclusively on the opportunity structure for intrastate violence, and suggest that grievances—in the form of resentment based on intergroup comparisons involving horizontal inequalities—often facilitate ethnic mobilization. According to them, "the perception of injustice generates grievances that serve as a formidable tool of recruitment" (Cederman et al., 2011: 5). Thus, grievances can facilitate mobilization. Oil, gas and diamonds may produce systematic economic, political and/or social inequalities between groups, such as the unequal distribution of oil rents, forced migration, environmental damage and the loss of land rights (Ross, 2004: 41). These social disruptions are effective drivers for the recruitment of insurgents who want to fight for an apparently noble cause (even when the recruitment pool is limited within small groups).

Along with grievance, greed is often mentioned as a major facilitator of rebellion (Collier and Hoeffler, 2004).[7] Rebellion can be viewed as the provision of a public good (e.g. to overcome common grievances). According to Hoeffler (2011), greed can help groups to overcome the "free riding" problem by generating private incentives. Natural resources may provide these kinds of selective incentives that encourage participation in rebellion. The promise of private returns—in the forms of immediate or future resource income—may motivate individuals to join in with the rebel cause. According to Abdullah (1998), for example, material rewards—such as the extraction of resources from diamond trading—generally explained an individual's decision to join the Revolutionary United Front (RUF) in Sierra Leone. Also, there is evidence that Sierra Leone's Civil Defense Forces engaged in diamond trading in order to offer material benefits for their fighters (Truth and Reconciliation Commission, 2004). Humphreys and Weinstein (2008: 448–449) find that "individuals offered money or diamonds were six times more likely to participate in the RUF". Money not only from drugs but also from oil enabled Colombian guerrilla groups—such as The Revolutionary Armed Forces of Colombia or the National Liberation Army—to recruit soldiers and finance armed insurgency in that country. By threatening to blow up pipelines and kidnapping contract workers, these guerrillas were able to collect protection money from oil extractors, thus filling the movement's coffers and allowing it to expand (see, e.g. Dunning and Wirpsa, 2004: 87). Participation in rebel movements may also be motivated by expectations about future income from resources (e.g. once key bodies managing resource revenues have come under the control of the insurgents).

In addition to providing a motive for mobilization in the form of greed or grievance, resources may also endow ethnic groups with the necessary financial means to acquire the essential resources for rebellion—such as weapons, know-how, logistic facilities, transportation or military equipment. When resources are "lootable", rebels can extract and sell these themselves. By using the threat of kidnapping or blowing up pipelines, they may impose

so-called "war taxes" on those who manage the resources. In addition, internal violence can be funded by selling future rights to extract fuels. Ross (2004) highlights the role of so-called "booty futures" in financing rebellion in countries such as Liberia, the Republic of Congo and Sierra Leone. Having the chance to secure resources in future combats, insurgents "are able to sell future mineral rights to foreign firms or neighboring governments" (Ross, 2004: 57). In the oil-rich Congo, a fierce power struggle between incumbent President Patrice Lissouba and former head of state Denis Sassou-Nguesso emerged in 1997. Sassou-Nguesso in particular was able to draw on external support from Angola and France, the latter being keen to avoid Lissouba potentially selling oil licenses to US multinational companies and not French Elf Aquitaine (now Total), which had traditionally dominated the oil sector in the former French colony (Englebert and Ron, 2004).

When ethnicity serves as a tool for mobilization in conflicts over natural resources, we must expect that the conflict itself features overtones of ethnic claims by rebel groups or the recruiting of rank-and-file members along ethnic lines (Wucherpfennig et al., 2012). Indeed, the civil war in Congo demonstrated such overtones, with warring factions recruiting along ethnic lines. This applies to many other violent conflicts over resources as well. In particular, ethnic groups may use commodities concentrated in their territory as a means by which to seek secession (Hoeffler and Collier, 2006; Sorens, 2011).[8] Secessionist and autonomist conflicts in, for instance, Angola, Indonesia and Nigeria all involved natural resources, but they can also be described as ethnic conflicts. Thus Cabindans in Angola demanded more autonomy and a greater share of oil income, with the same holding true for Acehnese in Indonesia and Ijaws and other groups in the Niger Delta (Le Billon, 2012).

In sum, we argue that within fractionalized societies resources such as oil may increase the potential for ethnic violence, by generating identity-based grievances and providing selective incentives in the form of prospective resource income. This helps groups to overcome their collective action problem and to mobilize for insurgency. Furthermore, commodities may be used to purchase the organizational and material resources needed for rebellion.[9]

Our main proposition is thus: collective violence—such as rebellion—requires motivation and opportunity in order to occur. Both ethnic diversity and natural resources can provide such conditions. While it is likely that ethnic fractionalization is a conflict risk on its own, particularly when based on politically relevant groups, we believe that the combination of ethnic fractionalization and natural resources further increases the risk of the onset of armed conflict between ethnic groups beyond additive, independent effects of both ethnicity and resources. Specifically, we expect that:

Hypothesis 1: Ceteris paribus, higher ethnic fractionalization in terms of politically relevant ethnic groups increases the risk of ethnic armed conflict.

Hypothesis 2: Ceteris paribus, the risk of ethnic conflict is further increased in resource abundant states.

At this point, it seems appropriate to note that we concentrate on ethnic fractionalization—rather than on other forms of ethnic heterogeneity such as polarization or dominance—for two main reasons. First, as shown in the literature review, the empirical evidence on the link between ethnic fractionalization and conflict is inconclusive thus far—while there is a broader scholarly consensus that ethnic polarization is associated with an increased risk of facing armed conflicts. Second, we assume that a higher number of ethnic groups spread

throughout the country increases the incidences of specific ethnic groups living within oil-rich areas. Oil production areas are commonly limited in geographical scope and relatively smaller groups are more likely to develop a sense of ownership regarding "their" oil compared with big groups inhabiting large areas that are only partly covered by oil.[10] A higher number of specific ethnicities inhabiting oil-abundant territory hence also increases the total number of ethnic groups members that may actually face oil-related deprivation such as ecological degradation or that use oil to finance rebellion. We therefore expect that a higher number of groups—or fractionalization—increases the likelihood that ethnicity and oil geographically match and thus lead to more ethnic conflict onsets. However, we certainly do not rule out the possibility that natural resources such as oil have a similar conflict-enhancing effect within a context of high ethnic polarization or dominance.[11]

Quantitative empirical analysis

This section employs time-series cross-sectional data in order to find quantitative evidence for our hypotheses. Past studies on the link between ethnicity and internal violence have relied almost exclusively on data from the UCDP/PRIO Armed Conflict Dataset (see Gleditsch et al., 2002). However, not all instances of violence coded as armed conflict by this dataset exhibit an ethnic component. It includes all kinds of (intrastate) conflict, and simply distinguishes between government and territorial ones, that is, those fought over the control of the central government or over specific territories within a country.

Given that the presented mechanisms refer to ethnic-based violence, we chose—in order to measure our dependent variable—the new dataset that has been compiled by Wucherpfennig et al. (2012), which explicitly links rebellion to ethnic groups. The authors match the non-state actor dataset (Cunningham et al., 2009) with the EPR dataset on politically relevant ethnic groups worldwide (Cederman et al., 2010). Examining the links between rebel organizations and ethnic groups avoids "some of the problems in previous subjective assessments of whether a given conflict is ethnic or not" (Wucherpfennig et al., 2012: 95). Only conflicts involving rebel organizations that pursue an ethnic agenda are considered. Furthermore, the authors determine whether or not the ethnic groups behind rebel movements have been excluded from politics by the central state.[12] The variable measuring ethnic conflict takes the value of 1 if the threshold of 25 battle-related deaths has been crossed for the first time, and 0 if no ethnic war has started in the year under consideration. Gaps in fighting of less than two years are ignored in order to determine whether a conflict is ongoing.

In order to measure ethnic diversity, previous studies have often used an ethnolinguistic fractionalization index (ELF) as developed by Fearon (2003)—who relied on sources such as the *Encyclopedia Britannica*, the CIA's World Fact Book and the Soviet Atlas Narodov Mira from 1964, among other sources.[13] Based on the Herfindahl concentration formula, ELF measures the probability that two randomly selected individuals from the entire population will be from different ethnic groups. Laitin and Posner (2001) argue, however, that attributing a single score to each country masks the degree to which ethnic identities vary over time and that it thus cannot capture the multidimensional quality of them. In particular, these measures ignore the salience of ethnicity—that is, whether an ethnic group is politically relevant or not (Posner, 2004).[14] Also, indicators of fractionalization based on common dispersion formulas do not account for the quality of inter-group relations such as political

exclusion.[15] According to Wimmer et al. (2009), studies on the ethnicity–conflict nexus should consider the actual constellation of power at the state center instead of employing purely demographic measures of ethnic diversity. As outlined in the literature review, the authors find that the exclusion of ethnic groups from state power explains armed conflict better than the conventional measures do.

Hence, as Fearon's indicator is constructed from enumerations of ethnic groups—irrespective of whether or not they are politically relevant—and does not, further, contain any information on ethnic exclusion, we decided to rely instead on the newly released EPR dataset. It "covers all politically relevant ethnic groups and their access to power around the world from 1946 through 2005" (Cederman et al., 2010: 87). For the purpose of our analysis we used the ELF index of Cederman et al. (2010), which is based only on politically relevant ethnic groups and calculated following the Herfindahl concentration formula. In addition, we also considered within each country the total number of politically relevant ethnic groups as well as the number of groups excluded from participation in central government. As we are interested exclusively in ethnic violence, we only considered conflicts involving rebel organizations that either pursued an ethnic agenda as the dependent variable or relied on "ethnic recruitment".[16] A total of 88 such ethnonationalistic armed conflict onsets occurred during the period under analysis (1963–1999).

Finally, resource abundance was measured by taking a country's average amount of oil extracted per day in a given year, measured in millions of barrels per capita.[17] We decided to concentrate on oil because previous quantitative and qualitative research found this resource in particular to be robustly linked to internal violence onset (Hegre and Sambanis, 2006). In order to choose our control variables, we relied on a sensitivity analysis performed by Hegre and Sambanis (2006). The authors tested the effect of 88 variables on minor and major civil war onset. As pointed out by Ray (2003), most of the researchers within the peace and conflict literature include control variables in their multivariate models merely because they also have an impact on their dependent variable. As noted by the author, the common practice of including variables that have an effect that is merely complementary to that of the key explanatory factor may be highly problematic. For this reason, we only chose control variables that are expected to influence the relationship between our key causal variable of interest and our dependent variable. Other control variables often considered by the literature (e.g. undemocratic neighbors or geographic regions) were thus omitted from the analysis. Applying this reasoning, we included the following control variables in our models: population size, income level, economic growth, recent political instability and rough terrain as well as war-prone neighbors.

In addition, we control for semi-democratic countries (anocracies) by including a dummy variable that takes the value of "1" whenever a country falls into the middle range of the Polity index for political regimes (see Jaggers and Gurr, 1995). As noted by Vreeland (2008), two components of the Polity index (PARCOMP and PARREG) are defined with explicit reference to civil war. For this reason, the author suggests recombining the Polity index by removing these two categories when assessing the impact of semi-democracies on intrastate violence. Following this reasoning, we constructed a new Polity index by adding up the categories XCONST, XRCOMP and XROPEN and constructing a dummy variable that equals "1" whenever a country falls into the middle range (-2 to $+3$) of this recombined Polity index. All control variables were lagged by one year in order to counter possible reversed causality.[18]

The risk of ethnic conflict onset was estimated using logit models. To minimize problems of temporal dependence on a history of conflict, a variable reflecting the duration since the last event onset (*peace*) as well as three natural cubic splines were included in all of the models, following the recommendation of Beck et al. (1998). Additionally, "rare event logit models"—as suggested by King and Zeng (2001)—were equally estimated. The authors show that, when binary-dependent variables measure the occurrence of "rare events", standard logit or probit estimations may produce biased coefficients.

Results

The empirical tests summarized in this section examined whether ethnic fractionalization (and ethnic exclusion) and oil wealth jointly affect ethnic armed conflict potential (according to the data of Wucherpfennig et al., 2012). To this end, calculating interaction terms would be the standard statistical procedure. However, as the majority of states are non-oil producers, an interaction variable between oil and ethnic fractionalization proved to be highly correlated with its constituting single terms ($r = 0.78$ and above). Thus, the introduction of an interaction variable would almost invariably lead to multicollinearity, producing inflated standard errors and biasing single parameter estimates.[19] In order to avoid this problem, we applied a subsample strategy—dividing the states into oil-abundant and oil-scarce according to various thresholds.[20]

Table 1 shows the results of very simple estimations including only our main independent variable of interest (ethnic fractionalization) and a peace years variable, measuring the number of years a country has lived in peace. Model I contains all countries (irrespective of their oil endowment) and suggests that, when an index of ethnic fractionalization that considers only relevant ethnic groups is used, a positive link between fractionalization and ethnic conflict onset can be identified, as expected by Hypothesis 1. Thus, by employing an alternative, salience-based, individual-level index of fractionalization and considering only armed conflicts that exhibit an ethnic dimension, we are able to corroborate recent findings showing that ethnic fragmentation is linked to an increased conflict potential (e.g. Taydas and Peksen, 2012).

In line with our second hypothesis, models III, V and VII indicate that oil significantly reinforces the violence-enhancing effect of fractionalization. The coefficients of the fractionalization variable are considerably higher in the oil-rich subsamples (in which oil production is above the sample's 60th, 75th or 90th percentile) compared with the oil-scarce subsamples. These differences in coefficients' size are even more pronounced once the control variables are introduced into the models (see Table 2). For example, the effect of fractionalization is nearly twice as large in model III (in which only countries with an oil production exceeding the sample's 60th percentile are considered) compared with model II (containing those states exhibiting an oil production below the sample's 60th percentile). These findings underline the assertion that resources such as oil may provide additional motives and means for ethnic rebel groups to take up arms.

The effect of ethnic fractionalization on ethnic war onset is substantively large. When standardized coefficients are computed for model I in Table 2, it turns out that fractionalization has the second-largest effect within all variables; only population size shows a greater effect. Expressed in odds ratio, it can be said that a 1% increase in the chance that two randomly selected individuals will be from different (politically relevant) ethnic groups increases

Table 1. Dependent variable: ethnic conflict onset

	Model I (all countries)	Model II (oil production below 60th percentile)	Model III (oil production above 60th percentile)	Model IV (oil production below 75th percentile)	Model V (oil production above 75th percentile)	Model VI (oil production below 90th percentile)	Model VII (oil production above 90th percentile)
Peace years	−1.948****	−0.529	−2.952***	−1.693**	−2.081**	−1.724***	−2.017
	(0.468)	(0.842)	(0.994)	(0.725)	(1.016)	(0.655)	(1.490)
Ethnic fractionalization$_{(t-1)}$	2.025****	1.410***	2.203****	1.689****	2.007***	1.725****	1.816**
	(0.318)	(0.452)	(0.630)	(0.416)	(0.762)	(0.394)	(0.885)
Constant	−2.571****	−3.091****	−1.829****	−2.377****	−1.929***	−2.487****	−0.462
	(0.313)	(0.620)	(0.513)	(0.413)	(0.626)	(0.380)	(0.899)
N	6608	2745	1823	3424	1144	4187	381
Probability $> \chi^2$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Pseudo R^2	0.113	0.045	0.224	0.101	0.168	0.094	0.316
McKelvey and Zavoina's R^2	0.157	0.089	0.225	0.129	0.204	0.129	0.257

Note: Logit models using robust standard errors (shown in parentheses) with onset of ethnic civil wars as dependent variable. We account for duration dependence using peace-years correction and three natural cubic splines calculated with the program BTSCS Data Analysis Utility Version 4.0.4.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$, **** $p < 0.001$.

Table 2. Dependent variable: ethnic conflict onset

	Model I (all countries)	Model II (oil production below 60th percentile)	Model III (oil production above 60th percentile)	Model IV (oil production below 75th percentile)	Model V (oil production above 75th percentile)	Model VI (oil production below 90th percentile)	Model VII (oil production above 90th percentile)
Peace years	−1.476***	1.277	−2.911***	−0.938	−2.185**	−1.174*	−4.736***
	(0.546)	(1.275)	(1.044)	(0.724)	(1.103)	(0.659)	(1.770)
Ethnic fractionalization$_{(t-1)}$	1.342***	0.968	1.829**	1.211**	2.188**	1.099**	16.32*
	(0.477)	(0.632)	(0.909)	(0.599)	(1.012)	(0.540)	(8.828)
Neighbors at war$_{(t-1)}$	−0.167	−0.241	−0.177	−0.293	−0.165	−0.348	−1.705
	(0.281)	(0.410)	(0.435)	(0.357)	(0.514)	(0.328)	(1.048)
Population (log)$_{(t-1)}$	0.376****	0.469****	0.308***	0.434****	0.432***	0.439****	3.893***
	(0.0751)	(0.132)	(0.115)	(0.0878)	(0.165)	(0.0798)	(1.347)
gdppc (log)$_{(t-1)}$	−0.358**	−0.473**	−0.364	−0.527***	−0.285	−0.514***	−4.975****
	(0.141)	(0.221)	(0.242)	(0.183)	(0.267)	(0.167)	(1.179)
Instability$_{(t-1)}$	0.174	0.851*	0.468	0.523	0.614	0.349	2.525**
	(0.357)	(0.435)	(0.649)	(0.408)	(0.726)	(0.390)	(1.269)
gdpgrowth$_{(t-1)}$	−2.475	−0.309	−3.612	−0.507	−3.797	0.161	−8.046
	(1.708)	(1.795)	(2.715)	(1.891)	(2.975)	(1.544)	(8.727)
Terrain$_{(t-1)}$	0.135	0.210	0.142	0.255**	−0.0757	0.172	−0.207
	(0.101)	(0.146)	(0.168)	(0.130)	(0.222)	(0.116)	(0.796)
Anocracy$_{(t-1)}$	−0.0612	−0.360	0.0230	−0.708*	0.549	−0.216	−2.800**
	(0.273)	(0.422)	(0.377)	(0.385)	(0.490)	(0.314)	(1.152)
Constant	−8.737****	−13.11****	−7.049****	−10.45****	−9.473***	−10.20****	−63.52**
	(1.268)	(2.202)	(2.010)	(1.486)	(2.936)	(1.279)	(25.79)
N	4730	2327	1719	2973	1073	3704	342
Probability $> \chi^2$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Pseudo R^2	0.169	0.101	0.271	0.167	0.215	0.145	0.630
McKelvey and Zavoina's R^2	0.216	0.218	0.294	0.249	0.285	0.216	0.956

Note: Logit models using robust standard errors (shown in parentheses) with onset of ethnic civil wars as dependent variable. We account for duration dependence using peace-years correction and three natural cubic splines calculated with the program BTSCS Data Analysis Utility Version 4.0.4.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$, **** $p < 0.001$.

the chance of an ethnic conflict onset by 14% in the all-country model (model I of Table 2). In the case of the oil-rich subsample considering only countries with an oil production exceeding the sample's 60th percentile (model III of Table 2), a 1% increase in *ethnic fractionalization* makes ethnic violence 24% more likely. All included independent variables show the expected signs. However, only two reach statistical significance at conventional levels of analysis: a highly populated state (population)—proxied by the log of the total population—increases conflict likelihood. In contrast, countries with higher per capita income levels (gdppc) tend to be spared from ethnic violence.

As outlined in the previous section, individual-level indices of fractionalization based on common aggregation formulas have been widely criticized for a variety of reasons. Therefore, we also consider the total number of politically relevant ethnic groups (assuming that more groups mean more fractionalization) as well as the total number of excluded groups. This way we are better able to account for inter-group-level relations, for instance, in terms of political exclusion. Table 3 shows that the total number of groups significantly increases the likelihood of ethnic armed conflict onset in all estimated models. Again, oil seems to amplify the effect of ethnic fragmentation (measured by the total number of politically relevant ethnic groups) on ethnic violence. The effect size of *number of groups* in the oil-rich subsamples (models III, V and VII) is approximately 2.6, 10.7 and 12.9 times larger than in the respective oil-scarce subsamples (models II, IV and VI).

Very similar results can be reported once the relevant control variables are introduced in the estimations (Table 4).[21] As indicated by standardized coefficients, the effect size of *number of groups* is the largest among all independent variables. Odds ratios reveal that the effect size of *number of groups* is substantive: each additional ethnic group increases the odds for an ethnic war outbreak by 4, 40 and 49% in models III, V and VII, respectively.

When the number of politically relevant groups excluded from central government is taken as a measure of both ethnic fractionalization and ethnic grievances the results are very similar. As evident from Table 5, *number of excluded groups* has a positive and significant effect on ethnic conflict onset in all estimated models. As in the previous analyses, the largest coefficients are found within the oil-abundant subsamples (models III, V and VII). The same applies for the estimations that include all pertinent control variables (Table 6). Note that in the full models of Table 6 the coefficients for *number of excluded groups* even lose statistical significance in two oil-scarce subsamples (models IV and VI). These results underline our assertion that natural resources such as oil may facilitate mobilization among ethnic groups by, for example, providing selective incentives that help groups overcome their collective action problem.

Several robustness checks were performed. We re-estimated all models using the ELF indicator in its classical form—that is, without taking into account the political salience of ethnicity. Results suggest that political salience does indeed matter for the interaction between oil and ethnicity: while the effect of the original fractionalization index on ethnic violence is particularly strong within one of the oil-abundant subsamples (p60), it shows no effect within the remaining subsamples (p60 and p75). Testing our argument with alternative dependent variables indicated that the combination of oil and ethnicity is particularly suitable for explaining ethnic violence, rather than armed conflict in general. The effect of the ELF indicator of Cederman et al. (2009) on minor civil war onset (as defined by the UCDP/PRIO data) within the oil-abundant subsamples is weaker. The size and statistical significance of the joint effect of *groups* (or *excluded groups*) on minor civil war onset is very similar to the previous findings though.[22] In sum, these robustness checks suggest that the

Table 3. Dependent variable: ethnic conflict onset

	Model I (all countries)	Model II (oil production below 60th percentile)	Model III (oil production above 60th percentile)	Model IV (oil production below 75th percentile)	Model V (oil production above 75th percentile)	Model VI (oil production below 90th percentile)	Model VII (oil production above 90th percentile)
Peace years	−1.983****	−0.486	−2.996****	−1.647**	−3.656***	−1.704***	−10.75**
	(0.468)	(0.833)	(0.904)	(0.720)	(1.410)	(0.654)	(4.362)
Number of groups$_{(t-1)}$	0.0393****	0.0266***	0.0683****	0.0325****	0.347***	0.0351****	0.453****
	(0.00592)	(0.0102)	(0.0105)	(0.00747)	(0.117)	(0.00709)	(0.134)
Constant	−1.652****	−2.459****	−1.027***	−1.597****	−2.883****	−1.699****	−1.907*
	(0.233)	(0.563)	(0.322)	(0.320)	(0.814)	(0.296)	(1.052)
N	6608	2745	1823	3424	1144	4187	381
Probability $> \chi^2$	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000
Pseudo R^2	0.096	0.032	0.230	0.087	0.231	0.081	0.430
McKelvey and Zavoina's R^2	0.075	0.038	0.186	0.067	0.266	0.070	0.495

Note: Logit models using robust standard errors (shown in parentheses) with onset of ethnic civil wars as dependent variable. We account for duration dependence using peace-years correction and three natural cubic splines calculated with the program BTSCS Data Analysis Utility Version 4.0.4.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$, **** $p < 0.001$.

Table 4. Dependent variable: ethnic conflict onset

	Model I (all countries)	Model II (oil production below 60th percentile)	Model III (oil production above 60th percentile)	Model IV (oil production below 75th percentile)	Model V (oil production above 75th percentile)	Model VI (oil production below 90th percentile)	Model VII (oil production above 90th percentile)
Peace years	−1.629***	1.156	−3.103***	−1.262*	−4.055**	−1.423**	−8.985**
	(0.554)	(1.293)	(0.978)	(0.735)	(1.670)	(0.667)	(3.904)
Number of groups$_{(t-1)}$	0.0508****	0.0509***	0.0583****	0.0434****	0.334**	0.0394****	0.402*
	(0.0104)	(0.0184)	(0.0164)	(0.0103)	(0.141)	(0.0101)	(0.213)
Neighbors at war$_{(t-1)}$	0.0851	0.00928	−0.0262	0.0900	−0.0946	0.0352	−0.790
	(0.262)	(0.393)	(0.423)	(0.327)	(0.535)	(0.297)	(1.156)
gdppc (log)$_{(t-1)}$	−0.386***	−0.481**	−0.532**	−0.511***	−0.398	−0.454***	−2.789***
	(0.130)	(0.221)	(0.237)	(0.164)	(0.331)	(0.154)	(0.917)
Instability$_{(t-1)}$	0.0861	0.900**	0.292	0.471	0.441	0.266	2.474**
	(0.359)	(0.432)	(0.696)	(0.408)	(0.895)	(0.393)	(1.233)
gdpgrowth$_{(t-1)}$	−1.901	0.158	−3.369	0.293	−1.918	0.695	−4.339
	(1.640)	(1.561)	(2.638)	(1.651)	(3.604)	(1.380)	(7.194)
Terrain$_{(t-1)}$	0.140	0.232*	0.0787	0.246**	−0.0737	0.184*	0.907**
	(0.0889)	(0.135)	(0.140)	(0.112)	(0.172)	(0.0994)	(0.427)
Anocracy$_{(t-1)}$	−0.145	−0.372	−0.249	−0.685*	0.257	−0.218	−1.368
	(0.281)	(0.416)	(0.403)	(0.389)	(0.499)	(0.320)	(1.184)
Constant	−1.929****	−5.182****	−0.693	−2.648****	−2.432**	−2.372****	1.525
	(0.399)	(1.445)	(0.597)	(0.560)	(1.076)	(0.498)	(3.321)
N	4734	2327	1719	2973	1073	3704	342
Probability $> \chi^2$	0.0000	0.0000	0.0000	0.0000	0.0006	0.0000	0.0000
Pseudo R^2	0.142	0.069	0.263	0.125	0.257	0.104	0.595
McKelvey and Zavoina's R^2	0.141	0.148	0.251	0.175	0.304	0.138	0.783

Note: Logit models using robust standard errors (shown in parentheses) with onset of ethnic civil wars as dependent variable. We account for duration dependence using peace-years correction and three natural cubic splines calculated with the program BTSCS Data Analysis Utility Version 4.0.4.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$, **** $p < 0.001$.

Table 5. Dependent variable: ethnic conflict onset

	Model I (all countries)	Model II (oil production below 60th percentile)	Model III (oil production above 60th percentile)	Model IV (oil production below 75th percentile)	Model V (oil production above 75th percentile)	Model VI (oil production below 90th percentile)	Model VII (oil production above 90th percentile)
Peace years	−2.002****	−0.482	−3.095****	−1.680**	−3.735***	−1.731***	−14.55***
	(0.464)	(0.833)	(0.915)	(0.719)	(1.449)	(0.653)	(5.211)
Number of excluded groups$_{(t-1)}$	0.0312****	0.0245**	0.0539****	0.0217**	0.324***	0.0248***	0.578***
	(0.00719)	(0.0111)	(0.0114)	(0.00989)	(0.125)	(0.00916)	(0.177)
Constant	−1.482****	−2.381****	−0.694**	−1.412****	−2.206***	−1.526****	−1.310
	(0.239)	(0.566)	(0.329)	(0.335)	(0.698)	(0.309)	(1.043)
N	6608	2745	1823	3424	1144	4187	381
Probability $> \chi^2$	0.0000	0.0002	0.0000	0.0000	0.0000	0.0000	0.0000
Pseudo R^2	0.089	0.031	0.212	0.079	0.222	0.074	0.439
McKelvey and Zavoina's R^2	0.069	0.036	0.164	0.059	0.229	0.062	0.570

Note: Logit models using robust standard errors (shown in parentheses) with onset of ethnic civil wars as dependent variable. We account for duration dependence using peace-years correction and three natural cubic splines calculated with the program BTSCS Data Analysis Utility Version 4.0.4.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$, **** $p < 0.001$.

Table 6. Dependent variable: ethnic conflict onset

	Model I (all countries)	Model II (oil production below 60th percentile)	Model III (oil production above 60th percentile)	Model IV (oil production below 75th percentile)	Model V (oil production above 75th percentile)	Model VI (oil production below 90th percentile)	Model VII (oil production above 90th percentile)
Peace years	−1.643***	1.139	−3.161***	−1.323*	−4.195**	−1.442**	−14.09
	(0.541)	(1.299)	(1.004)	(0.726)	(1.842)	(0.654)	(12.33)
Number of excluded groups$_{(t-1)}$	0.0352***	0.0430**	0.0396**	0.0173	0.328**	0.0171	0.643**
	(0.0117)	(0.0191)	(0.0182)	(0.0109)	(0.160)	(0.0107)	(0.316)
Neighbors at war$_{(t-1)}$	0.198	0.0557	0.111	0.241	0.0530	0.150	−1.255
	(0.257)	(0.395)	(0.406)	(0.324)	(0.500)	(0.293)	(1.377)
gdppc (log)$_{(t-1)}$	−0.403***	−0.495**	−0.595**	−0.509***	−0.394	−0.467***	−3.225****
	(0.129)	(0.221)	(0.236)	(0.161)	(0.306)	(0.151)	(0.897)
Instability$_{(t-1)}$	0.0341	0.884**	0.262	0.400	0.469	0.206	2.320*
	(0.361)	(0.439)	(0.682)	(0.412)	(0.893)	(0.396)	(1.331)
gdpgrowth$_{(t-1)}$	−1.709	0.0937	−2.793	0.510	−1.846	0.870	−3.813
	(1.633)	(1.539)	(2.617)	(1.617)	(3.496)	(1.331)	(7.285)
Terrain$_{(t-1)}$	0.145*	0.220*	0.0926	0.250**	−0.157	0.192**	0.691
	(0.0875)	(0.133)	(0.139)	(0.109)	(0.195)	(0.0975)	(0.426)
Anocracy$_{(t-1)}$	−0.114	−0.341	−0.243	−0.570	0.230	−0.156	−1.660
	(0.273)	(0.410)	(0.401)	(0.360)	(0.491)	(0.305)	(1.054)
Constant	−1.753****	−4.993****	−0.449	−2.437****	−1.740*	−2.211****	3.489
	(0.409)	(1.493)	(0.613)	(0.578)	(1.034)	(0.512)	(2.671)
N	4734	2327	1719	2973	1073	3704	342
Probability $> \chi^2$	0.0000	0.0001	0.0000	0.0000	0.0008	0.0000	0.0000
Pseudo R^2	0.133	0.066	0.250	0.115	0.253	0.096	0.611
McKelvey and Zavoina's R^2	0.140	0.144	0.244	0.167	0.285	0.137	0.831

Note: Logit models using robust standard errors (shown in parentheses) with onset of ethnic civil wars as dependent variable. We account for duration dependence using peace-years correction and three natural cubic splines calculated with the program BTSCS Data Analysis Utility Version 4.0.4.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$, **** $p < 0.001$.

assumed interaction effect between oil and ethnic fractionalization is particularly present when the political relevance of ethnicity and ethnic violence—as opposed to armed conflict in general—is considered.

The applied subsampling strategy may produce biased results if conflict outbreak precedes oil wealth. A total of 10 countries exhibited at least one conflict onset (considering the employed ethnic conflict data of Wucherpfennig et al., 2012) before becoming oil-abundant (on the p75 or p90 threshold): Angola, Bolivia, Cameroon, Georgia, India, Pakistan, the Philippines, Russia, South Africa and Sudan. Excluding from the estimations those ethnic wars that broke out before countries became oil-rich did not alter the results in any significant ways.

In addition, the findings proved to be robust to different estimation techniques and model specifications. As already noted, all the reported regressions were equally estimated by "rare event logit models", as suggested by King and Zeng (2001). In addition, the inclusion or exclusion of different sets of independent variables did not substantially alter the results.[23] Furthermore, a stepwise inclusion of all independent variables in the different models indicated that the reported coefficients are unlikely to be driven by multicollinearity. Likelihood ratio tests of the reported specification against several different nested models revealed that the applied full model does indeed have a proper specification.

Also, the regression analyses were repeated using subsamples of diamond-poor and diamond-rich countries. For the group-level indicators of ethnic fragmentation, results point in the same direction: while a high number of ethnic groups or ethnically excluded groups increases the risk of armed conflict onset in a diamond-abundant environment, their effect is non-significant or negative in diamond-poor settings. No significant effect can be reported for the ELF index within the diamond-rich subsamples though. This may be due to the fact that substantial diamond production is only present in a very limited number of countries, and as such there is much less variation to be explored. Finally, we also tested the joint effect of oil and ethnic polarization (employing the polarization indices from the EPR data set) as well as ethnic dominance (employing data from Fearon, 2003) on ethnic conflict. The results indicate that oil does not condition the effect of polarization or dominance on ethnic violence. Hence, it seems that oil only interacts with certain forms of ethnic heterogeneity such as fractionalization, thereby affecting countries' risk of experiencing ethnic conflicts.[24]

Discussion

Overall, we believe that our analysis provides substantial evidence that the interplay of identity- and resource-related problems is particularly explosive—and beyond additive effects. Additionally, and in contrast to many previous findings, we show that ethnic fractionalization does indeed increase the risk of armed conflict when the ethnic nature of it and only relevant groups are taken into account.

However, a number of caveats remain and open questions persist. First, predominantly owing to the space constraints, we have limited our study to oil (and, to a lesser extent, diamonds). It would, however, be particularly fruitful to more closely study in future the effects of other types of natural resources. The secessionist conflicts witnessed in the Democratic Republic of Congo's province of Katanga (Shaba), for instance, were largely related to the region's copper reserves.

Second, the space available here does not allow for the presentation of systematic and detailed country case evidence on exact causal mechanisms linking resources and ethnicity to violent conflict. Yet we have substantial evidence that the advocated causal mechanisms are systematically at work in real-world cases;[25] apparently, in highly fractionalized lower income countries, oil and diamonds may indeed make the difference. Armed conflict is extremely likely to emerge when resources are concentrated in the settlement areas of ethnic groups that are excluded from central political decision-making (e.g. Angola, Congo, the DRC, Ethiopia, Georgia, India, Indonesia, Iran, Myanmar, Nigeria, Pakistan, Sudan). In contrast, comparably fractionalized countries like Honduras, Malawi or Zambia that are without resources—or without a geographical overlap of resources and excluded groups, as is the case in Zambia—are spared from armed conflict. Additionally, natural resources in conflict cases are frequently located in peripheral regions and, further, rebels can access and exploit them. Looking at individual countries, "showcases" for this can certainly be found in Angola (Cabinda), the DRC (Katanga, Kasai), Iran (Kurdistan), Indonesia (Aceh), Nigeria (Delta), and Sudan (South). Rather unsurprisingly, many of these countries exhibit secessionist upsurges,[26] confirming the recent findings of Sorens (2011). In those other cases—such as Georgia (Abkhazians) and Pakistan (Baluchi)—that are not commonly cited as being notorious resource-related conflicts, the advocated mechanisms work surprisingly well.[27]

Third, the exact role of the state deserves further attention (see also Hendrix, 2010). We included GDP per capita—as a possible proxy for state capacity—as an important control variable in the regressions. However, we still lack convincing and unambiguous comprehensive data on state capacity that would make large-*N* comparisons possible. Finally, we have remained relatively silent on governance, institutions and decisions taken by elites (despite the fact that, by considering excluded ethnic groups, we have nevertheless indirectly referred to a governance dimension). Exact patterns of resource revenue redistribution—including the provision of public goods and the fair institutional representation of identity groups—are certainly interrelated areas of research that warrant further scholarly attention.

Conclusion

This paper has strived to reconcile the literatures on the ethnic and economic determinants of civil war, doing so by claiming that ethnically diverse societies are more prone to ethnic conflict onset whenever natural resources such as oil are involved. Collective violence—such as rebellion—requires motivation and opportunity, and both ethnic diversity and natural resources can provide these conditions. Apart from generating grievances, oil may provide private incentives—in the form of immediate material benefits or promises of future rewards—that help to overcome the collective action problem, thus facilitating the mobilization of ethnic groups. Regression estimations have lent positive quantitative evidence for our claims. Our results have shown that an individual-level fractionalization index based on the politically relevant groups and calculated using the Herfindahl concentration formula is associated with an increased risk of ethnic violence onset. This effect was found to be particularly strong in oil-rich settings. In combination with oil, salience-based indicators of ethnic fractionalization—such as the number of politically relevant groups (or excluded groups)—have also shown a substantive effect on ethnic conflict. It was also indicated that these

findings have proved to be robust to different model specifications and different estimation techniques.

Much room remains for future research. By focusing on ethnic difference in terms of a high number of ethnically diverse individuals or groups, this paper has concentrated merely on one aspect of ethnic heterogeneity. It would certainly be worthwhile to study more closely the possible interaction of natural resources with other types of ethnic heterogeneity.[28] This also holds true for the research into the effects of natural resources other than oil (and diamonds). Also, the subnational geo-referential matching of resource location, the presence of ethnic groups, and conflict onset is a promising avenue for future research. Ideally this would need to be combined with a more in-depth study of the exact causal mechanisms at the country or conflict case level. In this context, the systematic collection of data on resource-related grievances (also including ecological stress) and governance (such as the exact distribution of revenues or proactive countermeasures to resource-related grievances) and their precise interplay are deserving of further scholarly attention. Finally, it would be fruitful to extend the scope of the analysis to include both conflict duration as well as other forms of internal violence as dependent variables.

Acknowledgments

The authors wish to thank a number of anonymous reviewers for their helpful comments. Georg Strüver provided excellent assistance with data.

Funding

Funding for writing this article was provided by the German Research Foundation, as part of the research projects "Governing the Resource–Conflict Nexus" as well as "Is Resource Wealth a Risk Factor?" and "A Dangerous Liaison? Ethnicity, Natural Resources and Civil Conflict Onset".

Notes

1. For an overview of several related studies and the possible mechanisms driving the relationship between natural resources and civil war onset, see Humphreys (2005) or Ross (2004, 2006).
2. We prefer the following, more constructivist, understanding of ethnicity or ethnic identity (Horowitz, 1985; Posner, 2004): ethnic identity derives from differences in a variable set of identity markers, such as a particular faith, language, regional provenance and the like, but ultimately it results from being ascribed both from outside and by the self (and is, hence, principally subject to change).
3. For an extensive description of the measure's basic traits, see Esteban and Ray (1994). Esteban and Schneider (2008) provide an overview of the theoretical and empirical work on polarization and conflict.
4. These findings are challenged by the formal work of Esteban and Ray (2008), who suggest that polarization has a pacifying effect owing to the large costs incurred whenever equally powerful groups face each other. The authors point out that, when "conflict is very costly, as it will be in highly polarized societies, it is easier to find an agreement that is Pareto superior to the conflict regime" (Esteban and Ray, 2008: 166).
5. However, Schneider and Wiesehomeier (2008) have demonstrated that this finding does not hold true for autocracies. Arguing that "dominant groups can deter threats from real or potential challengers", they show that dominance reduces the risk of conflict within authoritarian regimes (Schneider and Wiesehomeier, 2008: 186).

6. Note that geographical affiliation—often associated with a shared history and overlapping regional and cultural cleavages—is different from ethnicity (although both concepts may coincide, such as is the case in many African countries).
7. According to Collier (2000: 97), "the true cause of much civil war is not the loud discourse of grievance, but the silent force of greed". Although this might be pertinent to some cases, it is virtually impossible to divulge the true intentions underlying insurgents' choice of action. In fact, Korf (2005) argues that greed and grievance are actually causally linked and reinforce each other. Humphreys (2005: 511) notes that the introduction of these terms "is unfortunate, not least because the distinction between them appears to be a moral rather than a positive one".
8. Buhaug (2006: 691) shows that this is especially true when "large and ethnically diverse countries contain a higher number of peripheral and possibly marginalized groups, as well as remote and inaccessible terrain, both of which are expected to favor secessionist insurgency".
9. One objection to our argument might arise from the citation of the possible peace-buying effects of resource production. Resource revenues may enhance the state's counterinsurgency capacity by financing an effective security apparatus or by buying support through redistributional policies and patronage (Basedau and Lay, 2009; Fjelde, 2009). Government spending on public goods such as health or social security seems to especially reduce the likelihood of civil conflict (Taydas and Peksen, 2012), while coercion plays only a marginal role (Fjelde and De Soysa, 2009). Thus, redistributional policies and patronage networks may offset the advocated consequences stemming from ethnicity and resource-related motives and opportunities. However, governments' per capita resource revenues must be very high in order for domestic stability to be maintained through redistribution or clientelism. It seems that only a few very resource-rich states in the Persian Gulf—such as Bahrain, Qatar and the United Arab Emirates—and elsewhere (Brunei, Gabon) satisfy this criterion (Basedau and Lay, 2009).
10. One case in point is highly fractionalized Indonesia. In the Indonesian provinces of Aceh and West Papua, oil and gas fields closely overlap with the settlements of the Acehnese and Papuans, respectively, making claims for a higher share in revenues extremely salient (Aspinall, 2007). Similar constellations can be found in fractionalized Angola, Nigeria and the DRC.
11. As part of our empirical analyses, we also tested the joint effect of ethnic polarization and dominance on ethnic conflict onset. The results will be reported in the subsequent section.
12. The authors establish two criteria with regards to the link between ethnic groups and rebels. First, a significant number of ethnic group members have to actively participate in the organization's combat operations. Second, the rebel organization must publicly announce that "it is operating on behalf of the relevant ethnic group" (Wucherpfennig et al., 2012: 95). When both of these criteria are met, a rebel organization is coded as "ethnic".
13. Other studies refer to the ethnolinguistic fractionalization measure of Alesina et al. (2003).
14. The author demonstrates that Fearon's measure is not appropriate for testing the link between ethnic diversity and economic growth, as it does not differentiate between politically relevant and irrelevant ethnic groups.
15. Cederman and Girardin (2007: 175) also note that ELF-based approaches are not appropriate for explaining ethnic violence, since ethnonationalistic civil wars are not the aggregated effects of individual-level processes and measures.
16. Note that, different than in Wucherpfennig et al. (2012), we consider a conflict as being ethnic whenever rebel organizations *either* pursue an ethnic agenda *or* rely on ethnic recruitment (while in the case of the former authors both criteria have to apply). We decided to rely on this coding of the dependent variable in order to maximize the occurrence of ethnic conflict outbreaks (when applying both criteria to define ethnic conflict onset, a total of 60 events—as opposed to 88 when relying on only one of the criteria—can be observed for the period under analysis). However, we stress that all estimations to be subsequently presented were rerun using the more restrictive definition of ethnic conflict by Wucherpfennig et al. (2012) and all major results did not change in a considerable way.

17. Data on daily per capita oil production comes from Humphreys (2005).
18. Table A1 in the Appendix discloses the definitions and sources for all employed variables and Table A2 provides the respective main descriptive statistics.
19. In fact, an analysis of the predictors' variance inflation factor pointed to the incidence of multicollinearity. Standard procedures such as centering the respective variables around their means could not diminish the problem.
20. Countries were considered oil-rich when their daily per capita oil production exceeded the sample's 60th, 75th, or 90th percentile. The value for the 75th percentile is almost identical to the mean. Split samples may be a more appropriate way to identify thresholds of resource abundance than an interaction term.
21. Given the strong correlation between number of groups and population size, we did not include the latter variable as a control in order to avoid potential multicollinearity problems. If population is included in the models, the differences in the coefficients' size of *number of groups* between the oil-abundant and oil-scarce subsamples are even larger, corroborating our hypothesis that oil reinforces the effect of fractionalization on ethnic conflict (results available upon request).
22. These results are available upon request.
23. In addition to the control variables reported above, measures of political regime (the full Polity index excluding the factional categories PARCOMP and PARREG), political centralization, illiteracy, school enrollment, infant mortality, primary commodity exports, partially free polities (measured by the Freedom House index) and the size of military personnel were equally considered. All of these results—which are not reported here owing to space constraints—are available upon request.
24. All of these results are available upon request.
25. The authors have performed a medium-*N* analysis of 17 highly fractionalized lower income countries in which causal mechanisms were systematically investigated. Results are available upon request.
26. It is also easy to find anecdotal evidence for resource-related grievances in some of these showcases (see, e.g. Le Billon, 2012; Ross, 2012).
27. For further country case information, please refer to Le Billon (2012) and Ross (2012).
28. In fact, some of the civil war countries indicating ethnic grievances and resource-related risks (e.g. Chad, Ethiopia, Sierra Leone, and Sudan) also exhibit fairly high polarization values (see Montalvo and Reynal-Querol, 2005).

References

Abdullah I (1998) Bush path to destruction: The origin and character of the Revolutionary United Front/Sierra Leone. *Journal of Modern African Studies* 36(2): 203–235.

Alesina A, Devleeschauwer A, Easterly W, Kurlat S and Wacziarg R (2003) Fractionalization. *Journal of Economic Growth* 8(2): 155–194.

Aspinall E (2007) The construction of grievance—Natural resources and identity in a separatist conflict. *Journal of Conflict Resolution* 51(6): 950–972.

Basedau M and Lay J (2009) Resource curse or rentier peace? The ambiguous effects of oil wealth and oil dependence on violent conflict. *Journal of Peace Research* 46(6), 757–776.

Beck N, Katz JN and Tucker R (1998) Taking time seriously: Time-series-cross-section analysis with a binary dependent variable. *American Journal of Political Science* 42(4): 1260–1288.

Blimes R (2006) The indirect effect of ethnic heterogeneity on the likelihood of civil war onset. *Journal of Conflict Resolution* 50(4): 536–547.

Buhaug H (2006) Relative capability and rebel objective in civil war. *Journal of Peace Research* 43(6): 691–708.

Bulte E and Brunnschweiler C (2009) Fractionalization and the fight over natural resources: Ethnicity, language, religion, and the onset of civil war. OxCarre Research Paper, no. 2009-17, Oxford.
Cederman L-E and Girardin L (2007) Beyond fractionalization: Mapping ethnicity onto nationalist insurgencies. *American Political Science Review* 101(1): 173–185.
Cederman L-E, Min B and Wimmer A (2009, May 1) Ethnic power relations dataset. Available at: http://hdl.handle.net/1902.1/11796 UNF:5:k4xxXC2ASI204QZ4jqvUrQ= =V1
Cederman L-E, Min B and Wimmer A (2010) Why do ethnic groups rebel? New data and analysis. *World Politics* 62(1): 87–119.
Cederman L-E, Weidmann NB and Gleditsch KS (2011) Horizontal inequalities and ethnonationalist civil war: A global comparison. *American Political Science Review* 105(3), 478–495.
Collier P (2000) Doing well out of war: An economic perspective. In: Berdal M and Malone DM (eds) *Greed and Grievance. Economic Agendas in Civil Wars*. London: Lynne Rienner.
Collier P and Hoeffler A (2004) Greed and grievance in civil war. *Oxford Economic Papers* 56(4): 563–595.
Cunningham DE, Gleditsch KS and Salehyan I (2009) It takes two: A dyadic analysis of civil war duration and outcome. *Journal of Conflict Resolution* 53(4): 570–597.
Doyle MW and Sambanis N (2000) International peacebuilding: A theoretical and quantitative analysis. *American Political Science Review* 94(4): 778–801.
Dunning T and Wirpsa L (2004) Oil and the political economy of conflict in Colombia and beyond: A linkages approach. *Geopolitics* 9(1): 81–108.
Ellingsen T (2000) Colorful community or ethnic witches' brew? Multiethnicity and domestic conflict during and after the cold war. *Journal of Conflict Resolution* 44(2): 228–249.
Englebert P and Ron J (2004) Primary commodities and war: Congo–Brazzaville's ambivalent resource curse. *Comparative Politics* 37(1): 61–81.
Esteban J and Ray D (1994) On the measurement of polarization. *Econometrica* 62(4): 819–851.
Esteban J and Ray D (2008) Polarization, fractionalization and conflict. *Journal of Peace Research* 45(2): 163–182.
Esteban J and Schneider G (2008) Polarization and conflict: Theoretical and empirical issues. *Journal of Peace Research* 45(2): 131–141.
Fearon JD (2003) Ethnic and cultural diversity by country. *Journal of Economic Growth* 8(2): 195–222.
Fearon JD (2005) Primary commodities exports and civil war. *Journal of Conflict Resolution* 49(4): 483–507.
Fearon JD and Laitin DD (2003) Ethnicity, insurgency, and civil war. *American Political Science Review* 97: 75–90.
Fjelde H (2009) Buying peace? Oil wealth, corruption and civil war 1985–1999. *Journal of Peace Research* 46(2): 199–218.
Fjelde H and De Soysa I (2009) Coercion, co-optation, or cooperation? State capacity and the risk of civil war, 1961–2004. *Conflict Management and Peace Science* 26(1): 5–25.
Fox J and Swamy A (2008) Introduction: Natural resources and ethnic conflicts in Asia Pacific. *Asia Pacific Viewopint* 49(1): 1–11.
Gleditsch NP, Wallensteen P, Eriksson M, Sollenberg M and Strand H (2002) Armed conflict 1946–2001: A new dataset. *Journal of Peace Research* 39(5): 615–637.
Gurr TR (2000) *Peoples Versus States: Minorities at Risk in the New Century*. Washington, DC: United States Institute of Peace Press.
Habyarimana J, Humphreys M, Posner D and Weinstein J (2007) Why does ethnic diversity undermine public goods provision?*American Political Science Review* 101: 709–725.
Hegre H and Sambanis N (2006) Sensitivity analysis of empirical results on civil war onset. *Journal of Conflict Resolution* 50(4): 508–535.
Hendrix CS (2010) Measuring state capacity: Theoretical and empirical implications for the study of civil conflict. *Journal of Peace Research* 47(3): 273–285.

Hoeffler A (2011) "Greed" versus "grievance": A useful conceptual distinction in the study of civil war? *Studies in Ethnicity and Nationalism* 11(2): 274–284.
Hoeffler A and Collier P (2006) The political economy of secession. In: Hannum H and Babbitt EF (eds) *Negotiating Self-Determination*. Lanham, MD: Lexington Books.
Horowitz DL (1985) *Ethnic Groups in Conflict*. Berkeley, CA: University of California Press.
Humphreys M (2005) Natural resources, conflict and conflict resolution. *Journal of Conflict Resolution* 49(4): 508–537.
Humphreys M and ag Mohamed H (2005) Senegal and Mali: A comparative study of rebellions in West Africa. In Collier P and Sambanis N (eds) *Understanding Civil War in Africa: Evidence and Analysis*. Washington, DC: World Bank.
Humphreys M and Weinstein JM (2008) Who fights? The determinants of participation in civil wars. *American Journal of Political Science* 52(2): 436–455.
Jaggers K and Gurr TR (1995) Tracking democracy's third wave with the Polity III data. *Journal of Peace Research* 32: 469–482.
King G and Zeng L (2001) Logistic regression in rare events data. *Political Analysis* 9: 137–163.
Korf B (2005) Rethinking the greed-grievance nexus: Property rights and the political economy of war in Sri Lanka. *Journal of Peace Research*, 42(2): 201–217.
Laitin DD and Posner DN (2001) The implications of constructivism for constructing ethnic fractionalization indices. *APSA-CP: Newsletter of the Organized Section in Comparative Politics of the American Political Science Association* 12(4): 13–17.
Le Billon P (2001) Angola's political economy of war: The role of oil and diamonds, 1975–2000. *African Affairs* 100(398): 55–80.
Le Billon P (2008) Diamond wars? Conflict diamonds and geographies of resource wars. *Annals of the Association of American Geographers* 98(2): 345–372.
Le Billon P (2012) *Wars of Plunder. Conflicts, Profits and the Politics of Resources*. London: Hurst.
Lujala P (2010) The spoils of nature: Armed civil conflict and rebel access to natural resource. *Journal of Peace Research* 47(1): 15–28.
Lujala P, Gleditsch NP and Gilmore E (2005) A diamond curse? Civil war and a lootable resource. *Journal of Conflict Resolution* 49(4): 538–562.
Mauro P (1995) Corruption and growth. *The Quarterly Journal of Economics* 110: 681–712.
Montalvo JG and Reynal-Querol M (2005) Ethnic polarization, potential conflict, and civil wars. *American Economic Review* 95(3): 796–813.
Murshed SM and Gates S (2005) Spatial-horizontal inequality and the Maoist insurgency in Nepal. *Review of Development Economics* 9(1): 121–134.
Olson M (1965) *The Logic of Collective Action*. Cambridge, MA: Harvard University Press.
Østby G, Nordas R and Rød JK (2009) Regional inequalities and civil conflict in Sub-Saharan Africa. *International Studies Quarterly* 53: 301–324.
Østby G (2008) Polarization, horizontal inequalities and violent civil conflict. *Journal of Peace Research* 45(2): 143–162.
Oyefusi A (2008) Oil and the probability of rebel participation among youths in the Niger Delta of Nigeria. *Journal of Peace Research* 45(4): 539–555.
Posner D (2004) Measuring ethnic fractionalization in Africa. *American Journal of Political Science* 48: 849–863.
Ray JL (2003) Explaining interstate conflict and war: What should be controlled for? *Conflict Management and Peace Science* 20(1): 1–31.
Reynal-Querol M (2002) Ethnicity, political systems, and civil wars. *Journal of Conflict Resolution* 46(1): 29–54.
Ross ML (2004) How do natural resources influence civil war? Evidence from 13 cases. *International Organization* 58: 35–67.
Ross ML (2006) A closer look at oil, diamonds, and civil war. *Annual Review of Political Science* 9: 265–300.

Ross ML (2012) *The Oil Curse. How Petroleum Wealth Shapes the Development of Nations*. Princeton, NJ: Princeton University.
Schneider G and Wiesehomeier N (2008) Rules that matter: Political institutions and the diversity–conflict nexus. *Journal of Peace Research* 45(2): 183–203.
Sen A (2008) Violence, identity and poverty. *Journal of Peace Research* 45: 5–15.
Snyder R and Bhavnani R (2005) Diamonds, blood, and taxes: A revenue-centered framework for explaining political order. *Journal of Conflict Resolution* 49(4): 563–597.
Sorens J (2011) Mineral production, territory, and ethnic rebellion: The role of rebel constituencies. *Journal of Peace Research* 48(5): 571–585.
Stewart F (2002) Horizontal inequalities: A neglected dimension of development. QEH Working Paper Number 81. Queen Elizabeth House, University of Oxford.
Taydas Z and Peksen D (2012) Can states buy peace? Social welfare spending and civil conflicts. *Journal of Peace Research* 49(2): 273–287.
Tilly C (1978) *From Mobilization to Revolution*. Reading, MA: Addison-Wesley.
Truth and Reconciliation Commission (2004) Vol. 3b. Accra: Graphic Packaging Ltd GCGL. Available at: http://www.sierra-leone.org/Other-Conflict/TRCVolume3B.pdf (accessed 13 October 2012).
Vreeland JR (2008) The effect of political regime on civil war. *Journal of Conflict Resolution* 52(3): 401–425.
Wimmer A, Cederman L-E and Min B (2009) Ethnic politics and armed conflict: A configurational analysis of a new global dataset. *American Sociological Review* 74(2): 316–337.
Wucherpfennig J, Metternich N, Cederman L-E and Gleditsch KS (2012) Ethnicity, the state and the duration of civil war. *World Politics* 64(1): 79–115.

Appendix

Table A1. Variable definitions and data sources

Variable	Definition	Source
Ethnic conflict	Armed conflicts involving rebel organizations that either pursue an ethnic agenda or rely on ethnic recruitment. Variable takes the value of 1 if a threshold of 25 battle-related deaths has been crossed for the first time in a given year (and 0 otherwise). Ongoing conflicts are coded as missings	Wucherpfennig et al. (2012)
Ethnic fractionalization	Herfindahl index measuring the probability that two randomly selected individuals from the entire population will be from different ethnic groups. Only politically relevant ethnic groups are considered	Cederman et al. (2010)
Neighbors at war	Whether a directly bordering country is at war in a given year. Coding of civil war events follows Doyle and Sambanis (2000)	Hegre and Sambanis (2006)
Population (log)	Population, log-transformed	Hegre and Sambanis (2006)
gdppc (log)	GDP per capita, log-transformed	Hegre and Sambanis (2006)

(continued)

Table A1. Continued

Variable	Definition	Source
Instability	Political instability: number of years since an institutional change that led to a minimum of three-point change on the Polity index	Hegre and Sambanis (2006)
gdpgrowth	Annual change in GDP, percent	Hegre and Sambanis (2006)
Terrain	The proportion of the country that is mountainous	Hegre and Sambanis (2006)
Groups	Number of ethnopolitically relevant groups	Cederman et al. (2009)
Excluded groups	Number of ethnopolitically relevant excluded groups	Cederman et al. (2009)
Anocracy	Dummy variable that equals "1" when a country's recombined Polity index (the sum of XCONST, XRCOMP and XROPEN) falls between −2 and +3	Polity IV Project (version 2010)
oil_pcproduction	Daily per capita production of oil (in millions of barrels)	Humphreys (2005)

Table A2. Descriptive statistics

Variable	Minimum	Maximum	Mean	Standard deviation
Ethnic conflict	0 (98.59%)	1 (1.41%)		
Ethnic fractionalization	0	0.9996	0.406	0.310
Neighbors at war	0 (62.1%)	1 (37.9%)		
Population (log)	10.43	20.95	15.45	1.77
gdppc (log)	−3.04	4.20	0.76	1.06
Instability	0	1	0.16	0.35
gdpgrowth	−0.52	1.55	0.02	0.07
Anocracy	0 (72.1%)	1 (27,9%)		
Terrain	0	4.56	2.19	1.40
Groups	0	47	3.74	4.62
Excluded groups	0	46	2.11	4.19
oil_pcproduction	0	4.92	0.05	0.34